IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE APPLICATION OF: CHRISTOPHER J. KOLP ET AL.

DOCKET NO.: 3267-02 CUSTOMER NUMBER: 26645

SERIAL NO.: 10/598,656 EXAMINER: L.S. CHOI

FILED: MAY 16, 2007 GROUP ART UNIT: 1796

TITLE: DISPERSANT VISCOSITY MODIFIERS BASED ON DIENE-CONTAINING POLYMERS

Wickliffe, Ohio

Hon. Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 C.F.R. §1.132

I, Matthew D. Gieselman, declare as follows:

I received a B.S. degree in the field of chemistry in 1998 from Olivet Nazarene University and a Ph.D. degree in the field of organic chemistry in 2003 from The University of Illinois.

I have been employed by The Lubrizol Corporation since 2003. Since that time I have been responsible for invention, process development, synthesis and formulation with dispersants, antiwear agents, friction modifiers and corrosion inhibitors.

I am a coinventor of the invention claimed in the above-mentioned case and I am familiar with the references which were used in the rejection thereof.

In order to illustrate the improvement in performance of the compositions of the above invention, I assembled information on the following experiments, which correspond to those reported as Example 26 (ref), Example 27 (ref), and Example 28 on page 23 of the Specification. In particular, I identified from our detailed corporate records, combined with my own knowledge, the specific identities of the dispersant components and the lubricant formulation compositions. While the specific syntheses and testing would have been performed by others, my familiarity with this area of chemistry and with the Mack T-11 soot testing, together with the detailed corporate records of our mutual employer, has enabled me to provide the following definitive identifications:

Example 26 (reference) is a baseline oil similar to a commercial composition, including an olefin copolymer viscosity modifier, detergent(s), overbased calcium

detergent(s), phenolic antioxidant(s), a corrosion inhibitor, and other conventional components. In particular, it contains the materials and amounts as shown in Table I, below.

Example 27 (reference) is a second baseline, identical to Example 26 except that it also contains a succinimide dispersant based on a isobutylene/isoprene polymer of M_n 2411 and a mixture of polyethyleneamines. The dispersant in this mixture corresponds closely to the material of Example 13 of WO 01/98387, Burrington.

Example 28 is substantially the same as reference Example 27 except that it contains, in place of the dispersant of Ex. 27, 3.1% (1.0% active chemical) of a dispersant viscosity modifier of the present invention. This was a different batch of the material that was prepared in Example 14 of the present application, that is, the amine was 4-aminodiphenyl amine and the maleinated polymer was based on an isobutylene/isoprene copolymer. The number average molecular weight, M_n, of the copolymer, was about 7000. The slight reduction in the amount of the viscosity modifier in this example will have no effect on the soot dispersion properties of the formulation.

Table I

Component, %	Ex. 26 (ref)	Ex. 27 (ref)	Ex. 28 (inventive)
conventional polyisobutene succinimide dispersant, including 50% diluent oil	9.44	9.44	9.44
zinc dialkyldithiophosphate, including 9% dil. oil	1.36	1.36	1.36
sulfurized olefin antioxidant	0.55	0.55	0.55
hindered phenolic ester antioxidant	1.19	1.19	1.19
overbased Ca sulfonate detergent, incl. 42% dil. oil	1.16	1.16	1.16
overbased Ca sulfonate detergent, incl. 47% dil. oil	1.57	1.57	1.57
overbased Ca phenate detergent, incl. 27% dil. oil	0.53	0.53	0.53
overbased Ca phenate detergent, incl. 39% dil. oil	0.95	0.95	0.95
corrosion inhibitor	0.03	0.03	0.03
polyisobutenyl succinic anhydride	0.06	0.06	0.06
additional diluent oil	0.46	0.46	0.46
Polymeric viscosity modifier (including dil. oil)	7.4	7.3	5.5
polyisobutene/isoprene succinimide with polyethyleneamines, incl. 55 % dil. oil		2.6 (1.2 active)	
polyisobutene/isoprene succinimide with **4-aminodiphenyl amine**, incl. 68 % dil. oil			3.1 (1.0 active)

Each of these three samples was subjected to the Mack T-11 test, as described on page 23 of the Specification. The results, viscosity increase as a function of time and wt % soot, are shown in Table II, which is duplicated from pages 23 and 24 of the Specification.

Table II

	Example 26 (ref) Baseline		Example 27 (ref) Baseline + IOB/IP dispersant		Example 28 Baseline + IOB/IP dispersant/VM	
time, hr.	wt % Soot	Viscosity increase, mm^2/s (cSt)	wt % Soot	Viscosity increase, mm^2/s (cSt)	wt % Soot	Viscosity increase, mm^2/s (cSt)
0	0.16	0.00	0.21	0.00	0.15	1.92
12	0.44	0.00	0.61	0.00	0.59	1.51
24	0.67	0.00	0.80	0.00	0.80	1.41
36	0.98	0.00	1.09	0.00	1.02	1.42
48	1.35	0.02	1.53	0.08	1.32	1.40
60	1.66	0.06	1.79	0.11	1.59	1.50
72	1.95	0.30	2.11	0.15	1.92	1.60
84	2.36	0.45	2.44	0.37	2.26	1.84
96	2.75	0.72	2.79	0.55	2.55	2.02
108	3.10	1.12	3.06	0.77	2.89	2.27
120	3.47	1.64	3.46	1.11	3.37	2.72
132	3.83	2.20	3.80	1.61	3.70	2.99
144	4.17	3.13	4.17	2.15	3.99	3.45
156	4.52	4.72	4.47	2.71	4.27	4.17
168	4.84	7.82	4.78	3.54	4.59	4.61
180	5.21	16.55	5.03	5.00	4.84	5.44
192	5.69	35.66	5.43	7.54	5.17	6.33
204	6.14	53.12	5.76	17.30	5.48	7.11
216	6.21	139.66	5.92	28.92	5.88	9.88
228	6.66		6.26	43.35	6.28	14.24
240	7.09		6.54	47.21	6.53	29.43
252	7.58		6.96	71.46	6.84	50.29

These results for Example 27 and Example 28 are graphically presented in the attached Figure.

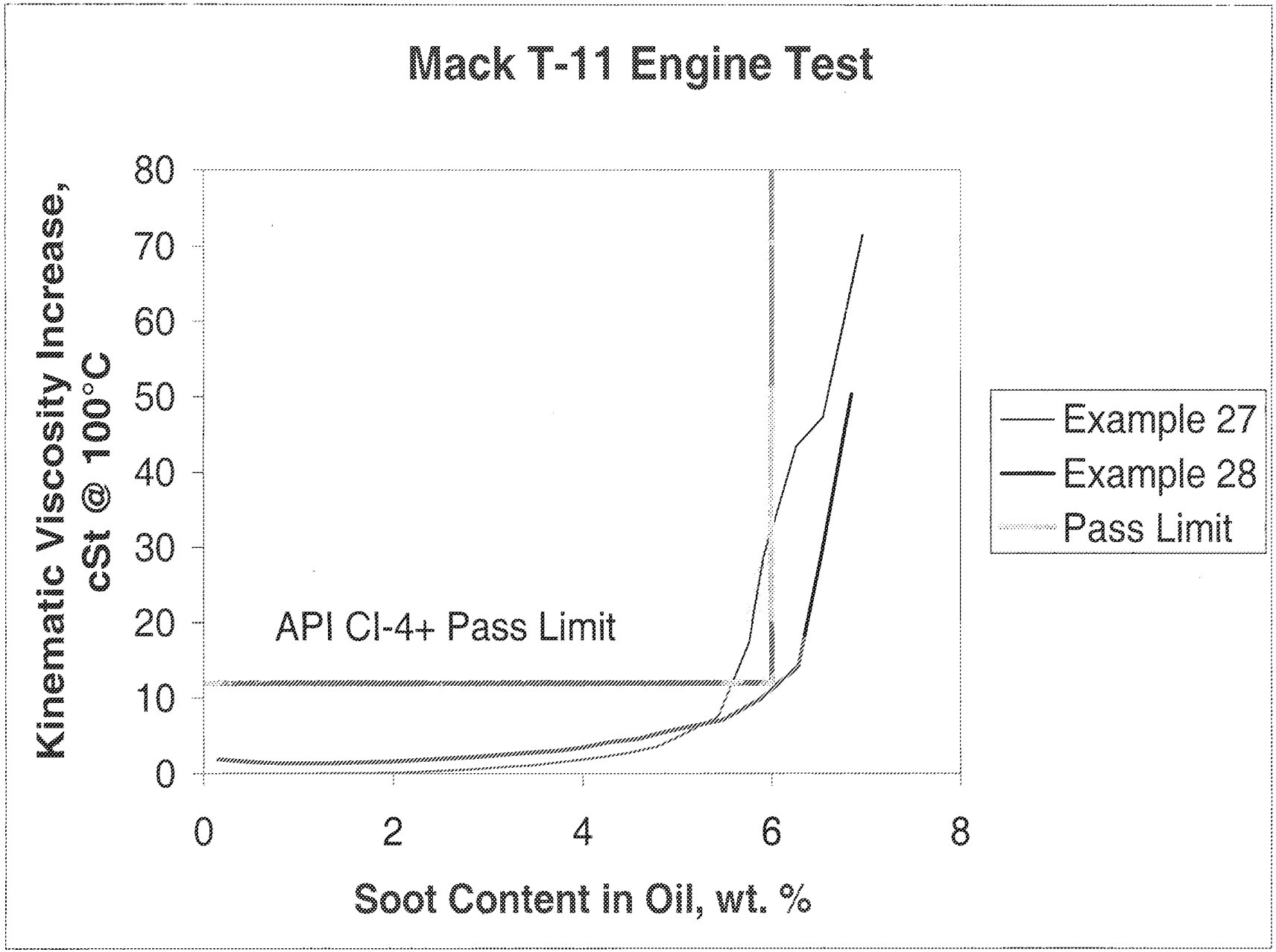
The results show that the prior art material of Example 27 exhibits a gradual increase in viscosity followed by a significant upward break at around 5.5% soot level (192 hours into the test). The material of Example 28 also exhibits a gradual increase in viscosity, but its significant upward break occurs around 6% soot (216 hours). This is a significant improvement in providing a lubricant which can handle an additional 0.5% of soot, compared with the prior art. In the Figure, the American Petroleum Institute

has established criteria for performance of oils in the "Service Category CI-4 plus" for use in high-speed four-stroke cycle diesel engines. Oils whose soot handling curves pass with in the rectangle shown in the upper left portion of the figure fail to meet those requirements. The reference material of Comparative Example 27 fails this test, while that of Example 28 passes.

I further declare that all statements herein made of my own knowledge are true and all statements herein made on information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Matthew D. Gieselman

1/6/2010 (date)


Mack T-11 Engine Test
Kinematic Viscosity Increase, cSt @ 100°C
80
70
60
50
40
30
20
10
0
API CI-4+ Pass Limit
0
2
4
6
8
Soot Content in Oil, wt. %
Example 27
Example 28
Pass Limit